

## **Small Skilled Nursing Care Facilities: A Profile of Motor Energy Efficiency Opportunities**

### **Summary**

Skilled Nursing Care Facilities (SIC 8051), according to the U.S. Standard Industrial Classification, are establishments primarily engaged in providing inpatient nursing and rehabilitative services to patients who require continuous health care, but not hospital services. The staff must include a licensed nurse on duty continuously with a minimum of one full-time registered nurse on duty during each day shift. Long-term care providers serve the fastest growing segment of the population—the elderly, aged 65 and over. For purposes of this Profile, we use the term “nursing homes” as synonymous with Skilled Nursing Care Facilities, and we address primarily small nursing homes, defined as those with less than 100 employees. Below are some quick facts about the nursing home industry:

- The elderly aged 65 and older comprised 11 percent of the 33 million population of California.
- By the year 2050, the elderly are expected to comprise 20 percent of the total U.S. population—a growth of almost 79 million persons.
- Since 1900 the percentage of Americans aged 65 and older has tripled and the absolute number of Americans aged 85 and older—representing 4.0 million individuals—was 33 times larger than in 1900.
- Small nursing homes in SCE territory earn \$500 million in annual revenue from operation of about 200 nursing homes, with an average of 50 employees per facility.
- 9 companies own multiple small nursing homes in SCE territory, including 2 of the top nursing facility chains in the U.S.
- U.S. nursing homes<sup>1</sup> average 37,000 square feet, and 2/3 are more than 25 years old.<sup>2</sup>
- Most motors in nursing homes are smaller than 10 hp and most of the motor electricity is used by motors less than 25 hp.
- Since most of the motors used in nursing homes are purchased on an OEM basis as part of other systems, they are not subject to the EPA's motor efficiency standards.
- A typical nursing home could cut energy costs by 8 percent, saving over \$11,000/year in energy costs, at a 3.5-year payback.<sup>3</sup>
- The California Association of Health Facilities (CAHF) has an aggregation initiative to reduce the energy costs of nursing homes and similar facilities, and may be able to assist SCE to promote motor efficiency and other energy cost savings.

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<sup>1</sup> The remaining bullets in this section are based on national or regional data from which we were unable to separately identify small facilities.

<sup>2</sup> DOE EIA 1995 Commercial Buildings Energy Consumption Survey (CBECS).

<sup>3</sup> Based on 26 XENERGY Inc. walk through surveys in 1998.

# 1 INDUSTRY DESCRIPTION

## 1.1 Types and Sizes of Nursing Home Facilities

In California, almost two-thirds (62.4 percent) of the nursing facilities in the state are owned by corporations that manage multiple facilities. These facilities have an average of 50 full-time equivalent (35 hours/week) direct care staff per nursing facility. These facilities also have an average of 101 beds and an average of 78 clients. Many of these nursing home corporations operate a small number of separate facilities, typically 2 to 3 separate nursing homes per corporation. Only the largest companies operate more than 3 nursing facilities. Generally, nursing homes are owner-occupied buildings with the electric bill paid by the nursing company.

In Southern California Edison's (SCE) service territory, consisting of 15 counties in Southern California, a total of 210 businesses are registered primarily as small skilled nursing care facilities (small being defined as less than 100 employees) that receive their electricity (between 250-2,499 MWh) from SCE. These businesses employ a total of 11,866 persons, and have sales of \$501.1 million. (Source: Dun & Bradstreet, Marketplace, October – December, 2000).

<b>Skilled Nursing Facilities in SCE Service Territory</b>			
<b>Number of Employees</b>	<b># Businesses*</b>	<b>Total Sales (Millions)</b>	<b>% Total Sales</b>
10-24	36	28.8	5.7 %
25-49	34	279.1	55.7 %
50-99	140	193.2	38.6 %
<i>Total</i>	<i>210</i>	<i>501.1</i>	<i>100 %</i>
Note: SIC 8051 businesses receiving their electricity from SCE			
Source: Dun & Bradstreet's Marketplace, October December, 2000			

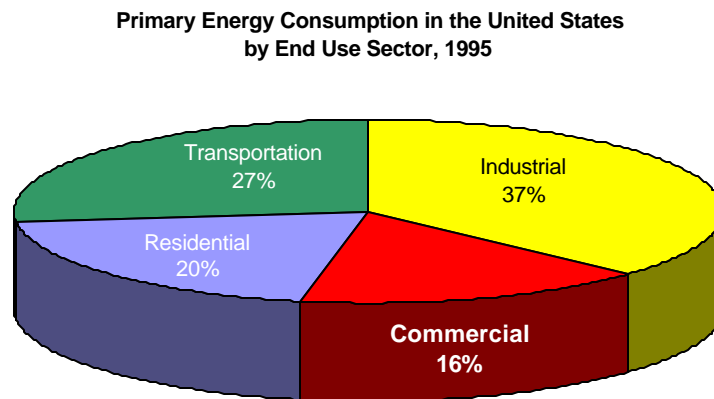
The following companies operate nursing facilities in the SCE territory, with the number of small nursing homes in parentheses:

- Beverly Enterprises Inc (4)
- Fountinview Convalescent Hosp (3)
- Longwood Management Corp (3)
- RRT Enterprises (2)
- Covenant Care California Inc (2)
- Sunset Haven Corporation (2)
- Sun Mar Management Services (2)
- Meridian Neuro Care Llc (2)
- Chw Central Coast (2).

Two of these -- Beverly Enterprises and Covenant Care California -- are among the top nursing facility chains, according to Provider magazine.

## 2 ENERGY USE

In 1995, throughout the United States, a total of 90.9 quadrillion BTUs of energy were consumed—14.5 quads were used by the commercial end use sector, of which Skilled Nursing Facilities are a part.



Source: ADL, 1999

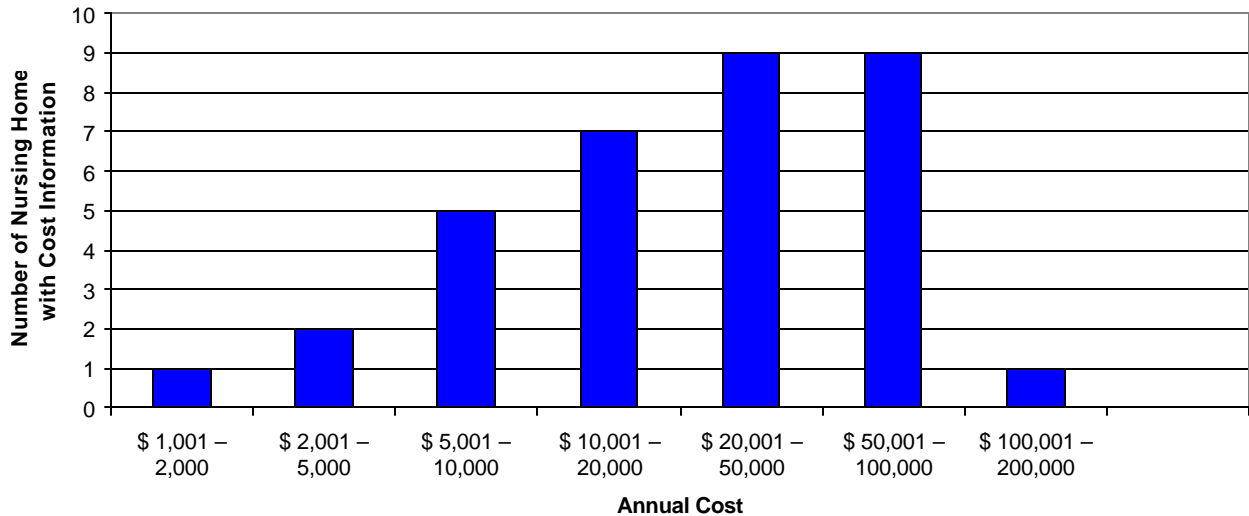
Based on data collected for the Energy Information Administration's 1995 Commercial Buildings Energy Consumption Survey (CBECS), 62 facilities surveyed classified their principle building activity as Nursing Home. Of these 62, almost 80 percent (49 facilities) had less than 100 employees. The following is a breakdown of information learned about nursing homes from the 1995 CBECS database.

The majority (60 percent) of these nursing homes had one floor. Almost 100 percent (48 of the 49 nursing homes) were single-location homes. Only one nursing home had three establishments.

These nursing homes operate on a continuous basis for the most part (12 months of the year, 24 hours per day). The buildings tend to be older, with 65 percent of the 49 nursing home facilities being constructed before 1975. The size of the homes range from 3,250 – 130,000 square feet, with the average size being just shy of 37,000 square feet.

To heat these buildings, the nursing homes rely for the most part on natural gas, which heats 59 percent of the homes. Electricity heats the majority of the remaining homes, almost 35 percent. To cool these buildings, the nursing homes rely heavily on electricity, which cools 88 percent of these homes. Almost 100 percent of these homes get their electricity from their local utility. The following figure breaks down the expenditures for electricity in 1995:

### 1995 Nursing Home Expenditures for Electricity



The annual electricity consumption for the 49 homes with fewer than 100 employees ranged from 18,737 to 1,677,715 kWh (64 – 5,724 MMBtu), with an average of 569,282 kWh (1,942 MMBtu). Based on the commercial electricity price in the State of California for 1997, we can estimate that the average nursing home with fewer than 100 employees would have spent over \$55,000 annually on electricity.

According to the results of a comprehensive 1998 energy audit of 26 nursing homes throughout the United States (specifically in Florida, Pennsylvania, Maryland, and Ohio), the largest single area of potential energy savings lay in improved HVAC systems.<sup>4</sup> The average facility in that study housed 153 beds, was approximately 57,000 sq. ft. in size (larger than the average size of nursing homes in the 1995 CBECS survey cited above), and consumed 8,410 MMBtu of energy, at an average cost of \$17.86 per MMBtu. By performing the HVAC upgrades on 11 of these nursing homes on a retrofit basis at an average cost of \$29,452,<sup>5</sup> annual savings of \$5,685 could be realized for an average simple payback of 5 years..<sup>6</sup> These HVAC measures accounted for about half of the energy savings that were economically available for these facilities.

<sup>4</sup> This audit was conducted by XENERGY, Inc. for ManorCare Health Services, Inc.

<sup>5</sup> This cost assumes that the HVAC system was replaced when still operable. Significant decreases in the incremental cost can be realized by replacing an HVAC system at the time it fails or needs repair.

<sup>6</sup> These 26 nursing homes could cut energy costs by 8 percent including lighting and other end use retrofits, saving over \$11,000/year in energy costs, at a 3.5-year payback.

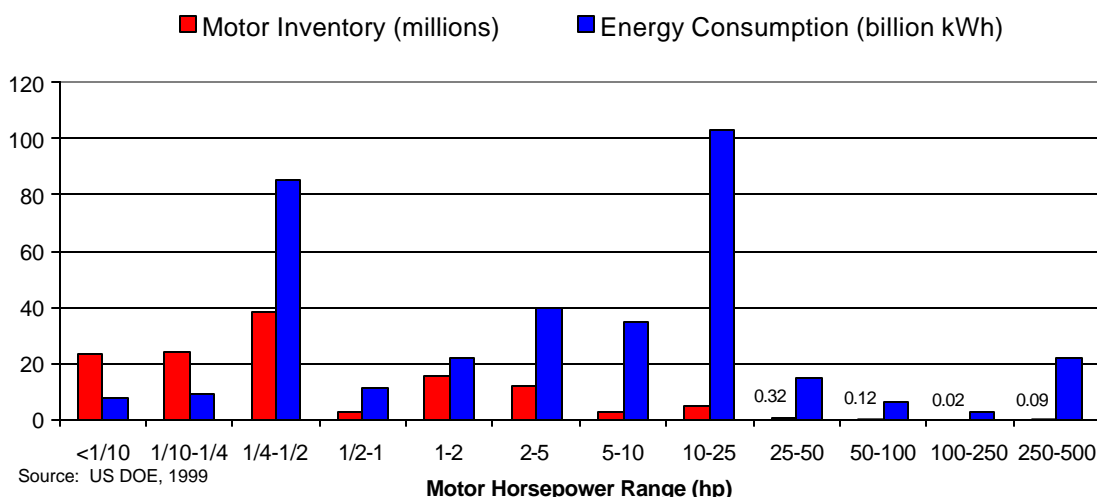
### 3 MOTOR USE

In the United States, electric motors account for more than 25 percent of the primary energy consumption in the residential and commercial sectors (US DOE, 1999). For the commercial sector, annual electric motor energy consumption is estimated at 3.8 quadrillion BTUs.

Most of the motors used in nursing homes and other commercial buildings are purchased as part of, or together with, other equipment or systems, such as air handlers, compressors and air conditioners. Since they are purchased on an OEM basis, they are not subject to the EPAct motor efficiency standards, and some such motors have significantly lower efficiencies than EPAct compliant motors, especially at or below 10 horsepower. For example, 1 hp motors are available at 70 percent efficiency compared to the EPAct standard of 80 percent for such motors. See section 5 below for recommendations on “Achieving Efficiency in OEM Equipment with

The vast majority of motors within the commercial buildings sector throughout the United States are motors with a horsepower of less than 25 hp. The smallest motors -- less than 1/10hp -- make up more than 69 percent of all commercial sector motors (US DOE, 1999) and account for 28 percent of motor energy use. Adding the motors up to 25 hp brings the percent of motor energy use to 87 percent (US DOE, 1999). The following table shows a breakdown of motor sizes and energy consumption for all commercial sector facilities, so small nursing homes are likely to have fewer of the largest size motors that this table would indicate.

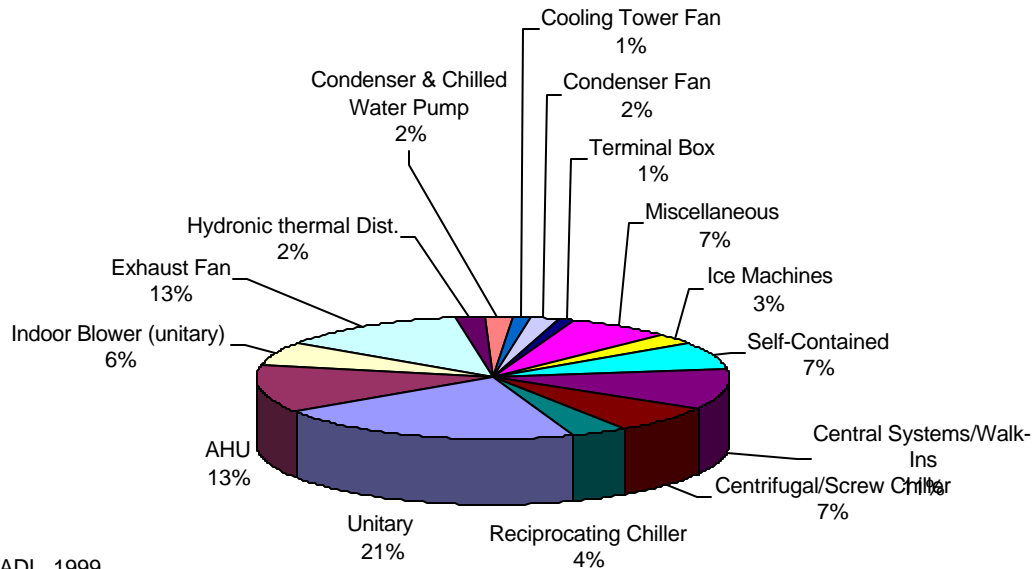
**Motor Inventory and Motor Energy Consumption  
in the Commercial Buildings Sector, 1995**



HVAC accounts for most of the motor use in nursing homes, as it does for many other commercial buildings. The following figure details the motor energy usage for the commercial sector as a whole, showing that space conditioning consumes approximately 72 percent of commercial sector electric motor energy: 40 percent for HVAC thermal distribution and 32

percent for HVAC compressors. Commercial refrigeration accounts for another 21 percent of motor use in the commercial sector, but is less predominant in nursing homes than in some other commercial building types (e.g., grocery).

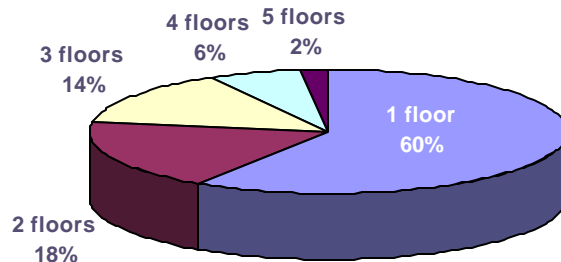
**Commercial Sector Motor Energy Use, 1995**



Source: ADL, 1999

The remaining commercial motor energy consumption is shared among small motors in office equipment, commercial laundry machines, and vertical transportation, none of which account for more than 1.5 percent of the total (US DOE, 1999). Nursing homes typically have ice machines, which represent 3 percent of overall commercial sector motor energy use. Elevator motors will also be found in many nursing homes; as illustrated in the accompanying pie chart, 40 percent of U.S. nursing homes are multi-story buildings (US DOE, 1999; CBECS, 1995; Rockwell, 2000).

**Nursing Home Building Heights**



## 4 MOTOR EFFICIENCY MEASURES

This section introduces some of the measures for improving the energy efficiency of motor systems, and provides some efficiency and cost data on sample motors, along with calculations to illustrate the financial costs and benefits of premium efficiency motors for nursing facilities. However, motor costs and performance specifications change over time, and individual nursing facilities may have different motor applications. Any site-specific or detailed analysis should therefore be based on updated information from sources listed in section 6, “Tools and Sources of Additional Information,” including:

- Consortium for Energy Efficiency ([www.cceformt.org](http://www.cceformt.org)) and
- DOE’s Best Practices (<http://www.oit.doe.gov/bestpractices/motors/>).

### 4.1 Types of Motor Efficiency Measures

HVAC accounts for most of the motor use in nursing homes, as it does for many other commercial buildings. Nursing facilities that have large chillers or other central HVAC systems provide opportunities to upgrade motors that drive chiller compressors and pump hot and cold water to fan coil units throughout the nursing home. Many of these motors can be expected to fall in the 5 to 10 horsepower range. The compressor motor(s) may be the largest motors in the building and may account for one-third or more of the facility’s motor energy use. IN many nursing homes, replacing a compressor motor with a premium efficiency model may represent the most cost-effective opportunity for improving motor efficiency.

The motors, fans or pumps used for HVAC thermal distribution from a nursing home’s central HVAC system may be smaller in size and less economical to replace, but should be considered, since together they are likely to use as much power as the compressor motor(s).

Facilities that do not have a central chiller, but that rely instead on individual room air conditioners, for example, may have few if any motors that are suitable to be replaced. Some fans used for ventilation of common spaces may be sufficiently large and accessible to consider upgrading them. However, individual room HVAC units have very small motors for which the energy efficiency gain may not justify the cost of replacing and reinstalling the motor.

Substantial growth is expected to occur in the U.S. Skilled Nursing Care industry over the next decade, and this expansion is likely to take place in the SCE territory at or above national growth rates. This will present substantial opportunities to encourage the specification and installation of the most efficient motors as part of this new construction. It will be important for SCE personnel to identify these new construction opportunities sufficiently in advance of construction so that SCE can best influence design decisions at the earliest stages, as discussed further below.

## **4.2 Financial Analysis of Motor Efficiency Decisions**

The first table below illustrates a financial analysis of a 10 horsepower motor upgrade investment, which shows a payback period of 2.9 years. This payback period is computed as the \$208 cost of the up-front investment divided by the annual savings of \$71. The investment was based on the incremental cost of the \$670 premium motor over the \$462 cost to rewind the failed motor.

While most energy cost reduction projects are selected on the basis of a simple payback calculation, the above financial analysis also shows calculations of two other performance measures that may be of interest to financial and accounting professionals at corporate offices of the companies that operate multiple nursing homes:

The first is the Internal Rate of Return percentage (IRR, or ROI for Return on Investment), which a treasurer would compare against the company's cost of capital or the profit that the company could earn on other investments. In this example, the IRR is a relatively attractive 33 percent over the term of this analysis (10 years).

The second measure is the Net Present Value (NPV) of the investment, based on the assumed discount rate (10 percent). In this case, the NPV is \$162, which is calculated as the discounted present value of the savings (\$369) minus the cost of the incremental up-front investment (\$208).

**Figure 1: Financial Analysis of a 10 hp HVAC Motor Upgrade Investment**

Scenario:	(a) Old Standard Efficiency Motor Before Failure	(b) Rewind Standard Efficiency Motor	(c) Replace with New Standard Motor	(d) Replace with Premium Efficiency Motor (CEE)
<b>Energy Cost Scenarios:</b>				
1 Efficiency (%)	86.1	85.1	89.5	<b>91.7</b>
2 Annual Electricity Use (kWh/year)	16,248	16,438	15,628	15,254
3 Annual Electricity Cost (\$ in first year)	\$ 975	\$ 986	\$ 938	\$ 915
<b>Returns:</b>				
4 Annual Savings (\$ in first year)		(Base)	\$ 49	\$ <b>71</b>
5 Cumulative Savings (for the period)			\$ 508	\$ 744
6 Present Value (PV) of Savings			\$ 252	\$ 369
<b>Investment Cost:</b>				
7 Equipment Cost (from Table)		\$ 462	\$ 440	\$ 670
8 Investment: Incremental Equipment Cost		(Base)	\$ -	\$ <b>208</b>
<b>Measures of Financial Performance:</b>				
9 Simple Payback Period (years)			-	2.9
10 Internal Rate of Return (IRR)			-	33%
11 Net Present Value (NPV)			\$ 274	\$ 162
<b>Assumptions:</b>				
12 Horsepower of Motor to Analyze	<b>10</b>			
13 kW Load (Row 12 * .746 kW/HP)	7.46			
14 Annual Operating Hours	<b>2500</b>	=	29% of 8,760 hours	
15 Average Loading While Operating *	75%		21% Load Factor	
16 Rewind Efficiency Loss (percentage points)	1.0%			
17 Discount on Price of New Motor	20%			
18 Cost of Electricity (cents/kWh)	<b>6.0</b>			
19 Electricity Cost Escalation per Year	1.0%			
20 Discount Rate for Present Value Calculations	15%			
21 Period Analyzed for PV & IRR Calculations	10 years			

More promising opportunities for motor efficiency in nursing homes are likely to be found in rooftop ventilation and other HVAC systems serving hallways and public areas in the nursing home. For example, the following financial analysis shows a 1.9 year payback from replacing a failed 3 horsepower motor, such as from an air handling unit, with a premium efficiency CEE motor, compared with rewinding the existing motor. While the annual savings and the overall value of this investment (the \$127 NPV) is smaller than that of the 10 horsepower upgrade analyzed above, its payback and IRR ratios are more attractive because the relative efficiency differential between standard and high-efficiency motors is actually greater for smaller capacity motors.

**Figure 2: Financial Analysis of a 3 HP HVAC Motor Upgrade Investment**

Scenario:	(a)	(b)	(c)	(d)
	Old Standard Efficiency Motor Before Failure	Rewind Standard Efficiency Motor	Replace with New Standard Motor	Replace with Premium Efficiency Motor (CEE)
<b>Energy Cost Scenarios:</b>				
1 Efficiency (%)	82.4	81.4	87.5	<b>89.5</b>
2 Annual Electricity Use (kWh/year)	5,094	5,156	4,796	4,689
3 Annual Electricity Cost (\$ in first year)	\$ 306	\$ 309	\$ 288	\$ 281
<b>Returns:</b>				
4 Annual Savings (\$ in first year)		(Base)	\$ 22	<b>\$ 28</b>
5 Cumulative Savings (for the period)			\$ 226	\$ 294
6 Present Value (PV) of Savings			\$ 138	\$ 179
<b>Investment Cost:</b>				
7 Equipment Cost (from Table)		\$ 332	\$ 268	\$ 384
8 Investment: Incremental Equipment Cost		(Base)	\$ -	<b>\$ 52</b>
<b>Measures of Financial Performance:</b>				
9 Simple Payback Period (years)			-	1.9
10 Internal Rate of Return (IRR)			-	54%
11 Net Present Value (NPV) .....			\$ 202	\$ 127
<b>Assumptions:</b>				
12 Horsepower of Motor to Analyze	<b>3</b>			
13 kW Load (Row 12 * .746 kW/HP)	2.238			
14 Annual Operating Hours	<b>2500</b>	=	29% of 8,760 hours	
15 Average Loading While Operating *	75%		21% Load Factor	
16 Rewind Efficiency Loss (percentage points)	1.0%			
17 Discount on Price of New Motor	20%			
18 Cost of Electricity (cents/kWh)	<b>6.0</b>			
19 Electricity Cost Escalation per Year	1.0%			
20 Discount Rate for Present Value Calculations	10%			
21 Period Analyzed for PV & IRR Calculations	10 years			

Many existing nursing home facilities rely heavily on through-the-wall room air conditioning or heating units in the patient's rooms and elsewhere, instead of the central HVAC approach discussed above. For these room units, the motors are very small (below 1 hp) and it may not be cost-effective to replace them unless an air conditioning unit fails. The most significant opportunities for improving motor efficiency for these units present themselves as part of decisions about purchasing and repairing the air conditioners themselves. For nursing homes with these room units, motor efficiency may therefore best be achieved through coordination with HVAC and other efficiency programs.

For additional perspective on potential motor efficiency measures, the following table summarizes energy saving options for several types of HVAC efficiency upgrades in commercial facilities, with estimates of available savings at the national level. (U.S. DOE, 1999)

Type of System	Annual Operating Hours	Current Energy Consumption (billion kWh)	Efficiency (%)		Energy Savings		Payback
			Current	Possible	Site (billion kWh)	Primary (trillion Btu)	
<i>Installing high efficiency compressor drive motors:</i>							
1 hp Room AC	1000	7.8	87	90	0.23	2.5	5.9 years
3 hp Small Unitary	1000	23.3	85	93	1.9	20.9	1.6 years
10 hp Medium Unitary	1200	26.1	87	94	1.8	19.8	4.5 years
<i>Installing high efficiency blower drive motors:</i>							
1 hp Room AC	1000	1.9	60	75	0.3	3.3	7.7 years
3 hp Small Unitary	2000	7.7	60	80	1.5	16.5	0.0 years
10 hp Medium Unitary	2500	8.3	80	90	0.8	9.1	0.4 years
Source: US DOE, 1999.							

In other, smaller end uses, ice machines present motor efficiency upgrade opportunities as well. Typically ice machines have capacitor start, induction run reciprocating compressors. By replacing this type of motor with a capacitor start, capacitor run compressor, efficiencies are increased by 5-10 percent. As these more efficient compressors cost \$20-30 more than the cost of the induction-run compressor, a simple payback of 1.8 years can be expected (US DOE, 1999).

## **5     MARKETING MOTOR EFFICIENCY TO SMALL NURSING FACILITIES**

This section provides recommendations for utility representatives or other energy efficiency professionals when contacting or visiting small skilled nursing facilities.

### **5.1     *Facilities and Decisionmakers to Target***

For many small nursing facilities, as noted above, a chiller's compressor motor may be one of the few motors in the building that it will be practical and cost-effective to replace. Therefore, one priority should be identifying and contacting first those facilities that have central HVAC plants. One approach to do this would be to inquire about the existence of central versus room-sized air conditioning in initial telephone contacts with individual nursing facilities.

Generally, the larger the facility, the greater will be the chance of finding motors of sufficient size to justify assessing them for efficiency opportunities. For example, facilities with more than one floor will have elevator motors which could be assessed.

For facilities that are owned by companies that also own other nursing homes, especially if they have an out-of-state headquarters, it may be necessary for utility representatives to treat them as they would other "national accounts." In such cases, the manager at a single nursing home may be required to deal with the headquarters operation through a centralized approval process. At headquarters there may be a Facilities Manager with responsibility for technical decisions across many facilities. Also, the decision may be made or directed by a Procurement or Purchasing Manager. The largest companies or those affiliated with hospitals may have a specialized Energy Manger who should be contacted.

In contrast, for single-plant, privately-owned or other nursing facilities where operational and investment decisions are made on-site, it is somewhat more likely that the decision will be made or reviewed by a business manager or a General Manager. Generally, nursing homes do not have on-site facility managers with the engineering skills needed to correctly size motors, tune air conditioning systems or otherwise optimize the energy using systems of which motors are a part.

For small single-site nursing homes, if the General Manager cannot be engaged in initial discussions of energy and motor efficiency, it may also be possible to contact someone in the accounting or finance area who would be knowledgeable about the bottom-line impact of energy costs and investments, who would be concerned about cutting energy costs, or who would approve spending money on new high-efficiency motors in the facility. It may be possible to identify such a business-oriented decisionmaker by starting with the clerk who pays the electric bill and ask for a referral to the Controller, Treasurer or another financial or business manager.

## **5.2 Increasing Customer Awareness of Motor Efficiency**

While awareness of increasing electricity costs is growing, awareness of energy efficiency in general and motor efficiency in particular remains low in the nursing home industry.<sup>7</sup> The information dissemination initiative of which this Profile is a part is an important response to this problem. Professionals involved in implementing this initiative must be prepared to present simple, introductory information to individuals in the nursing home business whose backgrounds do not equip them to fully understand the details of motor efficiency. For example, success stories can be important tools to establish credibility and motivate nursing home personnel to take the time to delve into motor efficiency. Such case studies can document the successful performance of actual motor-related investments in small nursing homes or similar commercial or health facilities.

Most technical or business staff will be aware of current new reports concerning electricity deregulation or electricity price and supply issues in the state. When dealing with financial or general business management personnel in particular, it will be important to start with this awareness and then emphasize the financial advantages of energy efficiency in general. The detailed financial costs and benefits of efficient motor systems can be emphasized once the existence of large motors has been confirmed or other motor-related opportunities have been identified.

## **5.3 Managing Complexities of Motor Specification, Installation and Adjustment**

In addition to general information such as success stories, the specific challenge is to provide enough practical information and other tools to local facility personnel or corporate decisionmakers so that they will be able to take specific steps to achieve efficiency gains.

As noted above, nursing homes generally do not have on-site facility managers with the engineering experience needed to correctly size motors, make adjustments during installation for the slightly increased speeds of high efficiency motors, match variable speed drives (VSDs) to the facility's existing systems, tune air conditioning systems or otherwise optimize the energy using systems of which motors are a part. As a result, even when nursing home personnel are aware of the potential to improve motor efficiency, they are likely to rely on their HVAC or electrical contractors to deal with any motor or HVAC problems, and potential opportunities to increase efficiency through selection of motors or optimization of systems are often lost.

One response to this problem is to work with trade associations, which can play a critical role in facilitating trust and communication between the right players in the Skilled Nursing industry and the SCE representatives and their trade allies.<sup>8</sup> Trade associations generally know key

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<sup>7</sup> In 1998 only approximately 19 percent of facilities personnel at U.S. industrial facilities were aware of energy efficient motors (US DOE, 1998), and awareness in most commercial facilities is likely to be lower than this.

<sup>8</sup> This is consistent with supporting other market transformation initiatives that target contractors and HVAC equipment suppliers.



of the new and expanded facilities are likely to be developed by companies that already own or operate nursing homes in the territory, all contacts with these existing industry players should include exploration of these potential growth opportunities.

A related challenge is presented by the financial pressures experienced at the present time by nursing homes, along with other health care providers, and the uncertainties associated with political and legislative policy debates over the future of Medicare. Nursing home businesses which are facing financial pressures at present, or which anticipate negative impacts from national or state policy changes, will be reluctant to give management attention to energy efficiency if they expect it to increase capital or operating expenditures, even by small amounts. SCE representatives should therefore be generally familiar with the current status of the national debate on these issues and should demonstrate an awareness that energy efficiency competes with “heavier” matters for management time and budget. This perspective will also help everyone to emphasize the financial and other benefits of energy efficiency and focus on the highest priority opportunities.

### **5.5 Achieving Efficiency in OEM Equipment with Small Motors**

As noted above, facilities that do not have a central chiller, but that rely instead on individual room air conditioners, for example, may have few if any motors that are suitable to be replaced. Individual room HVAC units have very small motors for which the energy efficiency gain may not justify the cost of replacing and reinstalling the motor. Premature failure of motors in such OEM equipment is not common and such motors are not often removed from the larger appliances of which they are a part for replacement in the same appliance.

With air conditioners and other “original equipment manufacturer “ (OEM) equipment that include small motors, the whole appliance is generally replaced if a motor or other significant component fails. When looking for opportunities to improve energy efficiency with such appliances, comparisons should generally be based on the efficiency of the entire appliance rather than comparing efficiencies of the motor components.

When a substantial number of small HVAC units or other OEM appliances are to be purchased for a new construction or major renovation project, it may be helpful to express an interest in premium efficiency motors as part of a directive to obtain the most energy efficient models. Otherwise, for individual appliance replacements, comparative energy efficiency information is readily available from sources such as the American Council for an Energy-Efficient Economy (ACEEE), which maintains updated information on its website on Top-Rated Energy-Efficient Appliances (<http://www.aceee.org/consumerguide/mostenef.htm>).

For larger unitary air conditioning and heat pump equipment (65,000 Btu or greater), information is available from the Consortium for Energy Efficiency’s High-Efficiency Commercial Air Conditioning & Heat Pumps Initiative (HECAC - <http://www.ceeformt.org/com/hecac/hecac-main.php3>), including a Fact Sheet, equipment database, specifications and data on per-unit

incremental costs and savings as well as a set of Commercial HVAC Installation Guidelines which nursing facility personnel could direct their architects or contractors.

## 6 TOOLS AND SOURCES OF ADDITIONAL INFORMATION

General sources of motor management tools and information include:

- Consortium for Energy Efficiency [www.ceeformt.org](http://www.ceeformt.org), and
- DOE's Best Practices ([www.oit.doe.gov/bestpractices/motors/](http://www.oit.doe.gov/bestpractices/motors/)) emphasizes industrial applications but has some information of use to nursing facilities.

These two web sites include the resources listed below.

### 6.1 *Motor Management and Planning Tools*

Energy Management for Motor Driven Systems – DOE guidebook designed to help establish a facility energy-management program, to identify and evaluate energy conservation opportunities involving motor-driven equipment, and to design a motor improvement plan.

Energy Star® Procurement Toolkit – [www.epa.gov/nrgystar/purchasing/](http://www.epa.gov/nrgystar/purchasing/)

### 6.2 *Motor Replacement Tools*

CEE Premium-Efficiency Specifications – utility-developed and supported efficiency recommendations for 114 classifications for motors.

Efficient Motors: Selection and Application Considerations -- CEE brochure provides a brief guide to understanding and selecting efficient motors. It contains several examples to help determine when using a premium-efficiency motor is appropriate.

MotorMaster+3.0 – A DOE energy-efficient motor selection and management tool including a catalog of over 20,000 AC motors: <http://mm3.energy.wsu.edu/mmplus/>

### 6.3 *Motor Repair Tools*

DOE-OIT's BestPractices Repair Tools for Motors

- **Motor Repair "Tech Brief"** – A general brochure explaining what is meant by quality repair and why it is important
- **A Shop Evaluation Guide** – to assist the customer in selecting a repair shop
- **A General Motor Repair Specification** – to request quality repair services
- **A Bibliography** –listing motor repair publications and materials.

Electrical Apparatus Service Association (EASA)

- **Tech. Note 16** – Guidelines for Maintaining Motor Efficiency During Rebuilding
- **A Guide to AC Motor Repair and Replacement**
- **AR100-1998 Recommended Practice for the Repair of Rotating Electrical Apparatus.**

California Motors Initiative's Guidelines to a Good Motor Repair.

## 6.4 Key Associations Serving Nursing Facilities

<p><b>American Seniors Housing Association</b> Washington, DC (202) 974-2300</p>	<p>Created in 1991, the American Seniors Housing Association (ASHA) represents members engaged in all aspects of the development and operation of housing for older adults, including construction, finance and management of seniors apartments, congregate seniors housing, assisted living, and continuing care retirement communities. ASHA has played an integral role in seniors housing advocacy by focusing on long-term care policy, state regulations, tax policy, building codes, property management and finance. ASHA's founders established the Association so professional owners and managers can play a key role in shaping the legislative and regulatory agenda of the seniors housing industry.</p>
<p><b>California Coalition for Compassionate Care</b> Sacramento, CA Judy Citko (916) 552-7573</p>	<p>The Coalition is a statewide partnership of 35 regional and statewide organizations dedicated to the advancement of palliative medicine and end-of-life care in California. With the purpose of promoting comprehensive high-quality and compassionate end-of-life care through:</p> <ul style="list-style-type: none"> <li>(1) increasing advance care planning and palliative care services;</li> <li>(2) leadership in the development and advocacy of improved practices; and</li> <li>(3) encouraging system-wide changes at the individual, organizational, community and state levels.</li> </ul>
<p><b>California Association of Homes and Services for the Aging</b> Sacramento, CA 916-392-5111</p>	<p>The California Association of Homes and Services for the Aging (CAHSA) was organized and incorporated in 1961 as a not-for-profit, tax-exempt California corporation. Originally formed to protect the tax-exempt status of its non-profit member homes, CAHSA has grown and evolved in its 30+ years. With almost 400 members, CAHSA is now an influential voice with legislators, regulators, boards and commissions in Sacramento</p>
<p><b>National Center for Assisted Living</b> Washington, DC 202/842-4444</p>	<p>The National Center for Assisted Living (NCAL) is the assisted living voice of the American Health Care Association (AHCA), the nation's largest organization representing long term care, ensuring quality and access to assisted living services.</p>
<p><b>California Association of Health Facilities</b> Sacramento, CA (916) 441-6400</p>	<p>The California Association of Health Facilities (CAHF) is a non-profit professional association founded in 1950 to serve as a statewide organization for long-term care providers. The Association and its members are dedicated to improving the quality of long-term health care in California through educational programs and proactive advocacy with the Legislature and administrative agencies.</p>

## **6.5 Selected References**

Darryl Nixon, telephone conversation, 20 December 2000, California Association of Health Facilities.

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Kermit Rockwell, telephone conversation, 7 December 2000, XENERGY, Inc.

US DOE, 1998. "United States Industrial Motor Systems Market Assessment Opportunities." Prepared for the United States Department of Energy (US DOE) Office of Industrial Technologies and Oak Ridge National Laboratory. Dec 98. Prepared by XENERGY, Inc.

US DOE, 1999. "Opportunities for Energy Savings in the Residential and Commercial Sectors with High Efficiency Electric Motors." May 14, 1999. Washington, DC. Prepared by Arthur D. Little, Inc.